

## ABSTRACT

Disclosed is a high-purity high-hardness ultrafine-grain diamond sintered body having a grain size of 100 nm or less, which is produced by subjecting an ultrafine-grain natural diamond powder having a grading range of zero to 0.1  $\mu\text{m}$  to a desilication treatment, freeze-drying the powder having a grading range of zero to 0.1  $\mu\text{m}$  to a desilication treatment, freeze-drying the desilicated powder in solution, enclosing the freeze-dried powder in a Ta or Mo capsule without a sintering aid, and heating and pressurizing the capsule using an ultrahigh-pressure synthesizing apparatus at a temperature of 1700°C or more and under a pressure of 8.5 GPa or more, which meet the conditions for diamond to be the thermodynamically stable. The present invention can synthesize a diamond sintered body under a lower pressure than that in a conventional method, with a diamond's original hardness and without containing any sintering aid.

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